

re-made by detaching the cover without disturbing the tubes or the tube-plate.

Circulating pumps are usually of the centrifugal type driven by electric motor, steam turbine, or high-speed reciprocating engine, according to their particular convenience. When the circulating water is taken from a river, canal, or cooling pond, the pipes are generally arranged on the closed or siphon system, that is, both the suction and delivery ends of the pipes are placed below the surface level of the water. In this case the power required for pumping is only that due to the resistance to the flow through the pipes and condenser. The over-all efficiency of a centrifugal pump when driven by an electric motor may be taken at 40 to 50 per cent if working freely without throttling of the water-supply.

In large-power installations the intake from the river should be well protected from the entry of weeds, leaves, &c., by means of a screen. This sometimes requires constant cleaning to prevent choking of the screen. To obviate this, self-cleaning rotary screens have been devised, such as that built by Messrs. Ledward & Beckett, Ltd.

In connection with the steam plant for a large building, works, or mill requiring a large amount of steam for heating purposes, the steam-engines or turbines may be arranged to exhaust into the pipes of the heating system, either at a pressure of 5 to 10 lb. per square inch above the atmosphere if the engines run under non-condensing conditions, or with a moderate degree of vacuum if running condensing. The heat in the exhaust steam may then be usefully employed for heating purposes, and thus save a corresponding amount of boiler steam. When the steam plant is shut down, then boiler steam would be supplied to the heaters if required. In summer the engines might exhaust into an ordinary condenser in the usual way if the exhaust steam is only required for heating the building.

As to whether it pays to run a steam plant in this manner depends largely upon the circumstances of each case, that is, as to whether the steam plant uses a large or a small amount of steam, and whether an appreciable amount of steam is required for heating purposes when the plant is running.

Rate of Heat Transmission in Surface Condensers.—Since the advent of the steam turbine, and because of its ability to use efficiently the highest vacuum obtainable in the condenser, much greater attention has been paid to the factors which influence the rate of heat transmission in surface condensers. The most important of these factors are the reduction of air leakage into the system to the lowest possible limits, the influence of the velocity of the water passing through the tubes; and the cleanliness of the tube surfaces. To prevent leakage of air as much as possible, the turbine glands are usually steam-packed, so that any leakage of the gland is that of steam into the turbine casing. Also, when the condenser plant is erected, the condenser and the exhaust-pipe connections should be blanked off and filled with water, which is then subjected to a pressure of a few pounds per square inch above atmospheric pressure. If any of the joints are leaky it then becomes evident by the leakage of the water; but notwithstanding all